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| 10/787,107 | 02/27/2004 | Hong Zhang | 9-13528-202US | 5069 |

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| EXAMINER | |
|---|---|
| ZHOU, YONG | |
| **ART UNIT** | **PAPER NUMBER** |
| 2609 | |
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| **Office Action Summary** | **Application No.** | **Applicant(s)** | |
|---|---|---|---|
| | 10/787,107 | ZHANG ET AL. | |
| | **Examiner** | **Art Unit** | |
| | Yong Zhou | 2609 | |

***-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --***

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) 1-21 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-21 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 27 February 2004 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 2/27/2004.

4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim et al. (US Patent Application No. 2002/0059025).

**Regarding claim 1**, Kim et al. teach a method (Abstract, line 1, and [0014], line 2) for computing an optimal route between a first node and other nodes of a traffic network using a weighted graph of interconnected nodes that represent the network, the optimal route being subject to a subset sequence constraint associated with a serial restriction group in the weighted graph ([0014], lines 2-5, wherein the turn restriction in vehicle traffic routing is one example of the claimed subset sequence constraint), the method comprising:

creating (assigning, [0014], line 6) a list of temporary labels respectively associated with the nodes of the graph, each node being assigned a primary label (Fig. 6, #602), and each node in the serial restriction group being additionally associated with a backup label (Fig. 6, #603; the virtual node L' is associated with a re-route with higher travel time value and the label associated with L' can be a backup label), the list initially

comprising a most optimal primary label of a root node that represents the first NE (Fig. 5A, #S504);

examining the list of temporary labels to identify a most optimal label, and making the identified label permanent to remove it from the list ([0014], lines 11-15);

selectively updating primary labels in the list for every node adjacent the permanently labeled node in order to ensure that the primary labels identify an optimal allowable path from the root node to the adjacent node ([0058], lines 1-2); and

repeating the examining and selectively updating until all primary labels of nodes representing the other NEs are permanent (Fig. 5B, #S508).

Kim et al. do not specifically teach the method of finding the shortest path for routing through the data network with serial restrictions.

However, the method of finding a shortest path from a starting place to a destination place in a traffic network including turn restrictions (equivalent to the claimed serial restrictions in the data network routing) ...using Dijkstra algorithm and Floyd-Warshall algorithm as taught by Kim et al. (Abstract) is very much analogous to and trying to solve the same problem as the claimed invention for data routing. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to apply the method taught by Kim et al. to the data network routing to achieve predictable results of finding the shortest path through the data network with serial restrictions.

**Regarding claim 2,** Kim et al. further teach that selectively updating further comprises:

selectively updating backup labels in the list for every node adjacent the permanent labeled node in order to ensure that the backup labels identify an optimal allowable path from the root node to the adjacent node that is allowably extended to another node in the serial restriction group ([0078], lines 1-3, and [0081], lines 1-2).

**Regarding claim 3**, Kim et al. further teach that creating comprises initializing each of the temporary labels to include an optimization parameter that is least optimal, and an identifier of a null path ([0051], lines 1-3, and [0052], lines 1-5).

**Regarding claim 4**, Kim et al. further teach that initializing each of the temporary labels comprises assigning a cost ([0051], lines 1-3), which is the optimization parameter, and examining the list comprises selecting a least cost temporary label ([0055], lines 1-2).

**Regarding claim 5**, Kim et al. further teach that selectively updating the backup labels comprises ensuring that a backup label of the adjacent node is initialized unless the primary label path of the adjacent node cannot be allowably extended to a node in the serial restriction group, in accordance with the subset sequence constraint ([0078], lines 1-3).

**Regarding claim 6**, Kim et al. further teach that selectively updating the backup labels further comprises setting a restriction flag ([0040], lines 3-4, restriction path "6-5-8" can be a restriction flag) at the adjacent node and saving a previous primary label as the backup label (Fig. 6, #603, label associated with the virtual node L' can be a backup label) when the primary label is updated to identify a path that is not allowably extended to another node in the serial restriction group, and further comprising unsetting the

restriction flag at the adjacent node and reinitializing the backup label of the adjacent node if the primary label of the adjacent node is subsequently updated to identify a path that is allowably extended to another node in the serial restriction group ([0040], lines 5-6; it is inherent that when changing routing through 6-5-2-5-8 to avoid the turn restriction 6-5-8, then the restriction flag is not in effect and re-initialization is necessary).

**Regarding claim 7**, Kim et al. further teach that selectively updating the primary label further comprises determining whether a path of the permanently labeled node extended to the adjacent node is allowable by the subset sequence constraint using at least one of: a rule for inclusion of members in the subgroup; and a list identifying allowable sequences of nodes ([0035], lines 8-10).

**Regarding claim 8**, Kim et al. further teach that the subset sequence constraint includes subset intransitivity (Fig.3, #310, turn-restriction is an example of subset intransivity), and the determining whether the path is allowable comprises determining that the path of the permanently labeled node extended to the adjacent node is not allowable if the adjacent node is in the serial restriction group, and a restriction flag is set at the permanently labeled node( Fig. 5B, #S510).

**Regarding claim 9**, Kim et al. further teach that the subset sequence constraint includes a subset serial restriction (Fig.3, #310, turn-restriction is also an example of subset serial restriction ) which precludes paths that include two links between three nodes in the serial restriction group, and wherein the determining whether the path is allowable further comprises determining that a path of permanently labeled node

extended to the adjacent node is not allowable if the adjacent node is in the path of permanently labeled node (Fig. 5B, #S510).

**Regarding claim 10,** Kim et al. further teach that:

the allowable paths are subjected to a plurality of subset sequence constraints, associated with respective disjoint serial restriction groups (Fig. 3, wherein restriction groups 3-4-7 and 6-5-8 are disjoint);

initializing further comprises indicating each node's membership in a serial restriction group by assigning a one of a plurality restriction flags uniquely associated with respective serial restriction groups ([0040], lines 3-5, one of the restriction flags "6-5-8" and "3-4-7" can be assigned to indicate the node's membership in either of the two disjoint turn-restriction groups); and

determining whether the path is allowable further comprises determining whether any of the subset sequence constraints precludes the inclusion of members in the corresponding serial restriction groups ([0035], lines 8-10).

**Regarding claim 11,** Kim et al. teach a method (Abstract, and [0014], line 2) for deriving an optimal route from a first node in a network to other nodes in the traffic network, wherein the route is subject to a subset sequence constraint ([0014], lines 2-5, wherein the turn restriction is one example of the claimed subset sequence constraint), the method comprising:

obtaining a weighted graph representing the network, the graph comprising nodes representing NEs in the network, a subset of the nodes being identified as

members of a serial restriction group (Fig. 2, wherein 3-4-7 and 6-5-8 are two turn-restriction groups in the graph); and

constructing a spanning tree over the graph rooted at a root node which represents the first NE by:

iteratively expanding the tree to include a node to which a path from the root node is allowable in accordance with the subset sequence constraint, and is most optimal among the paths to nodes outside of the tree ([0035], lines 5-6); and

if the path to the node cannot be extended to a node in the serial restriction group, re-including the node through a secondary path to the node that can be extended to a node in the serial restriction group, when the secondary path is most optimal among the paths to nodes outside of the tree ([0040], lines 3-7, and Fig. 3, path 310 along 6-5-8 is a turn restriction path, reselect a path 6-5-2-5-8 can avoid the turn restriction).

Kim et al. do not specifically teach the method of finding the shortest path for routing through the data network with serial restrictions.

However, the method of finding a shortest path from a starting place to a destination place in a traffic network including turn restrictions as taught by Kim et al. (Abstract) is very much analogous to and trying to solve the same problem as the claimed invention for data routing. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to apply the method taught by

Kim et al. to the data network routing to achieve predictable results of finding the shortest path through the data network with serial restrictions.

**Regarding claim 12,** Kim et al. further teach that constructing the spanning tree further comprises:

initializing a set of primary labels, each associated with a respective node ([0076], lines 1-3);

initializing a set of backup labels, each associated with a respective node in the serial restriction group ([0078), lines 1-3); and

setting an optimization parameter of the label of the root node to a most optimal value ([0053], lines 1-2, and Fig. 5A, #S505).

**Regarding claim 13,** Kim et al. further teach that:

including a node in the tree comprises permanently labeling the node and updating temporary labels of nodes adjacent to the permanently labeled node ([0014], lines 11-15); and

iteratively expanding further comprises choosing the node that is most optimal from among the temporary labels ([0014], lines 11-12).

**Regarding claim 14**, Kim et al. further teach that:

updating temporary labels comprises:

ensuring that a primary label of the node identifies an optimal allowable path from the root node to the labeled node ([0013], lines 2-4); and

if the identified path to the node is not allowably extended to a node in the serial restriction group, ensuring that a backup label of the node identifies an optimal allowable path from the root node to the labeled node that is allowably extended to a node in the serial restriction group (([0040], lines 3-7, and Fig. 3, path 310 along 6-5-8 is a turn restriction path, reselecting a path 6-5-2-5-8 can avoid the turn restriction); and

re-including a node comprises making permanent a backup temporary label ([0014], lines 14-15).

**Regarding claim 15**, Kim et al. further teach that:

determining whether a path of a permanent label extended to a node is allowable by the subset sequence constraint using at least one of a rule, and a list identifying allowable sequences of nodes ([0035], lines 8-10);

not updating a temporary label of the node if the path is not allowable ([0014], lines 11-13, and [0065], lines 2-4; if the path is not allowed (turn restriction), the path value would be significant large and therefore, would not be selected to update the label value for the node); and

setting a restriction flag at the node if the temporary label is a primary label that is changed because the path is allowable, but is not allowably extended to another node in the serial restriction group ([0040], lines 3-4, restriction path "6-5-8" can be a restriction flag).

**Regarding claim 16**, Kim et al. further teach that the subset sequence constraint includes subset intransitivity (Fig.3, #310, turn-restriction is an example of subset

intransivity), and the determining whether the path is allowable comprises determining that a path to a node n is not allowably extended to an adjacent node m in the serial restriction group, if the restriction flag is set at n (Fig. 5B, #S510).

**Regarding claim 17**, Kim et al. further teach that the subset sequence constraint includes a subset serial restriction (Fig.3, #310, turn-restriction is also an example of subset serial restriction) which precludes routes that follow two links between three NEs that correspond to nodes in the serial restriction group, and the determining whether the path is allowable further comprises determining that a path to a node n extended a node m is not allowable if m is in the path to n (Fig. 5B, #S510).

**Regarding claim 18,** Kim et al. further teach that a plurality of disjoint serial restriction groups are defined over nodes in the graph (Fig. 3, wherein restriction groups 3-4-7 and 6-5-8 disjoint), and initializing further comprises indicating each node's membership in a serial restriction group by defining restriction flags uniquely associated with respective serial restriction groups ([0040], lines 3-5, restriction flags "6-5-8" and "3-4-7" for two disjoint turn-restriction groups).

**Regarding claim 19**, Kim et al. teach a route selection processor adapted to use a weighted graph representing nodes in a traffic a network to identify an optimal route from a first node of the network, to other nodes of the network, subject to a subset sequence constraint, the route selection processor ([0085], lines 1-3; it is inherent that that the instructions stored on the computer-readable medium must be processed by a processor in order to perform the invention) adapted to:

construct a spanning tree over the graph rooted at a root node representing the first NE (starting node, [0051], line 3) by:

iteratively expanding the tree to include a node of the graph to which a path from the root node is allowable, in accordance with the subset sequence constraint, and is most optimal among the paths to nodes outside of the tree ([0035], lines 5-6); and

if the path to the node cannot be extended to a node in a serial restriction group that includes some of the nodes in the graph, re-including the node through a secondary path to the node that can be extended to a node in the serial restriction group, when the secondary path is most optimal among the paths to nodes outside of the tree ([0040], lines 3-7, and Fig. 3, path 310 along 6-5-8 is a turn restriction path, reselect a path 6-5-2-5-8 can avoid the turn restriction).

Kim et al. do not specifically teach the method of finding the shortest path for routing through the data network with serial restrictions.

However, the method of finding a shortest path from a starting place to a destination place in a traffic network including turn restrictions as taught by Kim et al. (Abstract) is very much analogous to and trying to solve the same problem as the claimed invention for data routing. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to apply the method taught by Kim et al. to the data network routing to achieve predictable results of finding the shortest path through the data network with serial restrictions.

**Regarding claim 20**, Kim et al. further teach that the subset sequence constraint includes a subset intransitivity limitation (Fig.3, #310, turn-restriction is an example of

subset intransivity) on allowable paths, and a determination that a path to a node is not allowable is made by preventing a path from extending over three consecutive nodes in the serial restriction group ([0065], lines 2-4).

**Regarding claim 21**, Kim et al. further teach that the subset sequence constraint precludes routes that have two links between two of three NEs that are represented by nodes in the serial restriction group (Fig.3, #310, turn-restriction is also an example of subset serial restriction), and a determination that a path to a node is not allowably extended to an adjacent node is made by preventing the adjacent node from being labeled if it is included in the path ([0065], lines 2-4).

## ***Conclusion***

3. Any Response to this Office should be **faxed** to (571) 273-8300 or **mailed to**:

Commissioner for Patents,
P.O. Box 1450
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**Hand-delivered responses should be brought to**
Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, VA 22314

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yong Zhou whose telephone number is (571) 270-3451. The examiner can normally be reached on Monday - Friday 8:00am - 5:00pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benny Q. Tieu can be reached on (571) 272-7490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

YZ

Benny Q. Tieu

BENNY Q. TIEU
SPE/TRAINER